Active Region Sources of Solar Wind at Solar Activity Maximum

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Two step (ballistic plus potential magnetic field) mapping of solar wind from ACE and Ulysses to the solar surface has shown that both coronal holes (as seen in Helium 10830 A) and active regions are sources of solar wind during solar activity maximum (Neugebauer et. al, to be published, JGR 2002). In Neugebauer et. al (2002), the source region was designated as an active region if the field lines threading the spacecraft mapped to a strong magnetic field region with no Helium 10830 A coronal hole nearby. Here, we continue to explore these active region solar wind sources by (a) determining the corresponding NOAA active region designation of the source; (b) using the potential field model to determine the geometry of both open and closed field lines emanating from the active region; and (c) characterizing the coronal structure above the source region as seen in soft X-rays (Yohkoh/SXT) and EUV (SOHO/EIT) images. The observed coronal structures are compared to the magnetic structure of the corona from the potential magnetic field model to understand how the open flux relates to the closed flux of the active region. To date, we have found two types of magnetic topology. In one type, the source region is a lane of open flux between two arcades of closed loops connecting the active region field to nearby regions of opposite polarity. The lane of open flux has a corresponding low emissivity soft X-ray and EUV feature; this is the topology found by Levine et al (Ap J, 1977) in an analysis of Skylab data. In the second type of topology, the open flux comes from the edge of the strong field region on the side away from the opposite-polarity region to which the closed field lines connect. Again, a corresponding low emissivity region is evident in the coronal images. We also compare the properties of the solar wind from these active regions to the properties of the slow and fast wind observed at solar minimum.